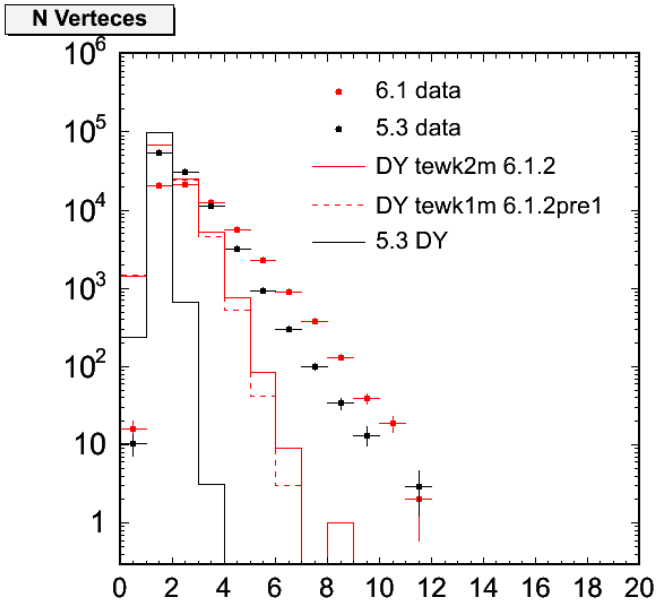
6.1.2 Drell Yan MC validation

Comparing 3 different tarballs for Drell Yan ($Z \rightarrow \mu\mu$)

- 5.3 (z8v2gt)
- 6.1.2pre1 (tewk1m) improvement to CMX geometry (better handling of keystone, miniskirt and unstable channels)
- 6.1.2 (tewk2m) bug fixes for CMP volume, additional improvement to CMX geometry



	Min run N	Max run N	Missing Runs
6.1 data – bexo2h	195409	201349	[186598;195409];[201349;203799]
5.3 data - sewkbd	141544	186598	
5.3 DY – z8v2gt	141572	179055	
6.1.2pre1 DY - tewk1m	190753	191778	
6.1.2 DY - tewk2m	190863	193061	

Event Selection

- Good Run List
  - GRL v7 (e-mu-noSi) for 5.3 data and MC
  - GRL v9 (e-mu-noSi) for 6.1 data and MC
- Select events with two ID muons
  - Leading muon must be High pt Muon
  - Second leg can be a medium pt muon (pt>5 GeV)
  - Second leg can be a CMIO
- Cosmic rejection

(on top of the standard cosmic filter, cut on acollinearity)

- At least one vertex in the event
- $\Delta Z_{\mu 1,\mu 2}$ <5 cm and $\Delta Z_{\mu vtx}$ <5 cm
- Invariant mass of OS muons in mass range [76;106] GeV

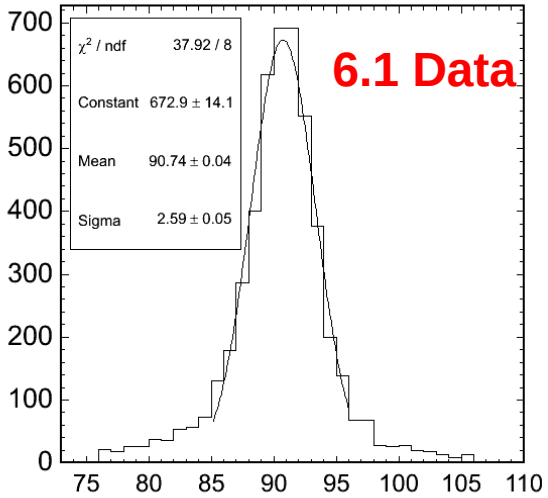
1)High pt muon
BC pt > 20 GeV
loose track requirement
CDF 7367

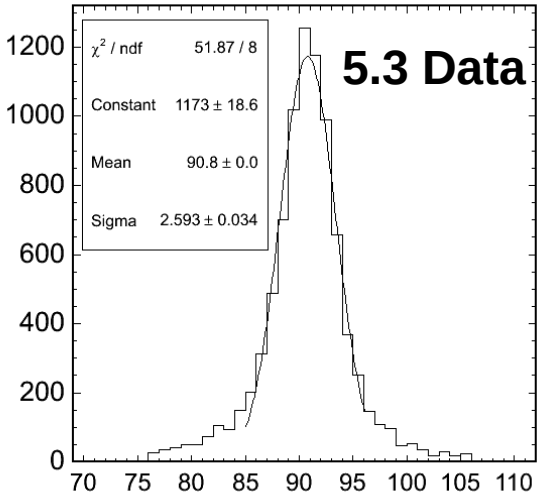
2) Medium pt muon
BC pt > 5 GeV
loose track requirement
CDF 7197

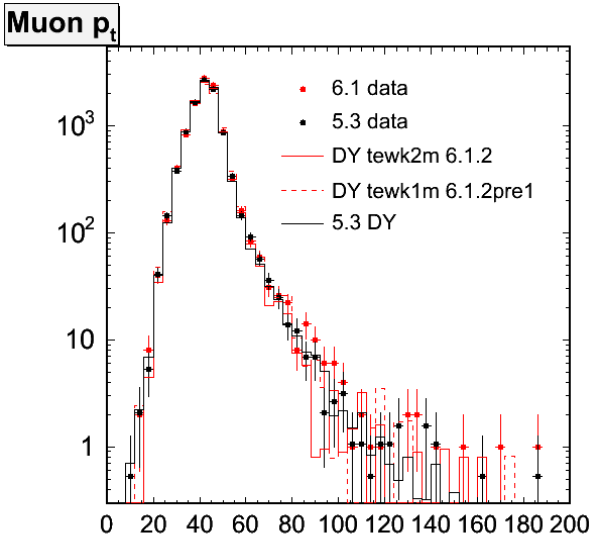
3) CMIO muon
BC pt > 10 GeV
tight track requirement
not fiducial to CMUP
not fiducial to CMX
other ID criteria as for stub μ
CDF 7367

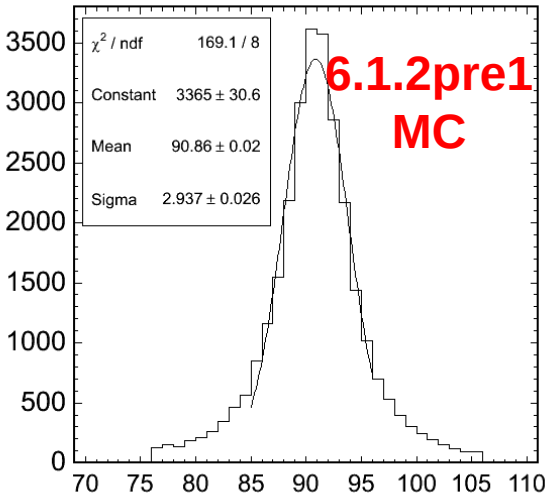
Invariant Mass of OS μ

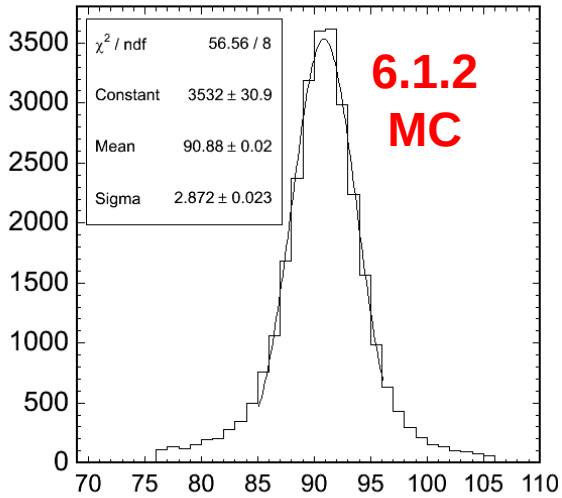
	Mean	RMS
5.3 data	90.8	2.6
6.1 data	90.7	2.6
6.1.2pre1 DY	90.9	2.9
6.1.2 DY	90.8	2.9







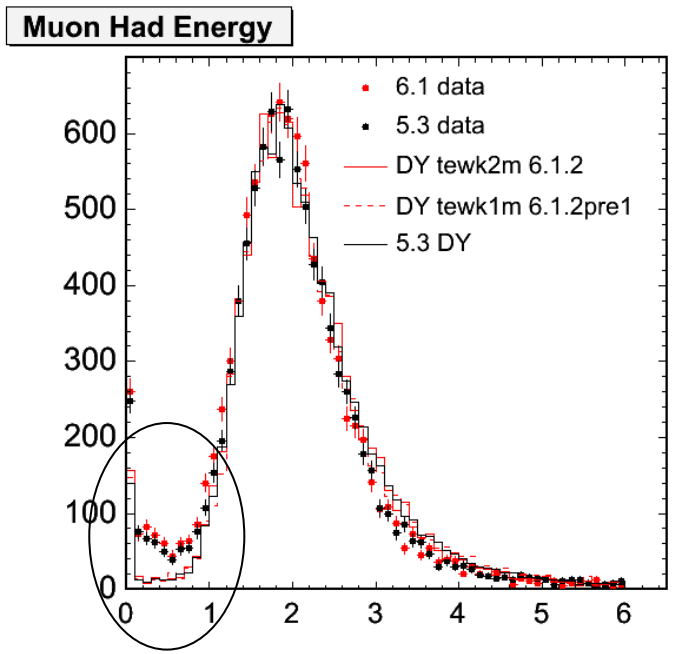


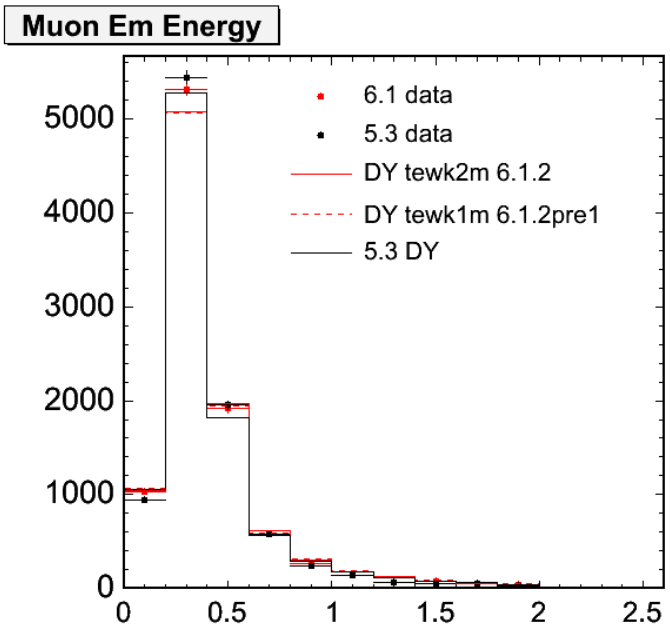


Muon calorimeter variables

Unless specified, normalize to the number of entries

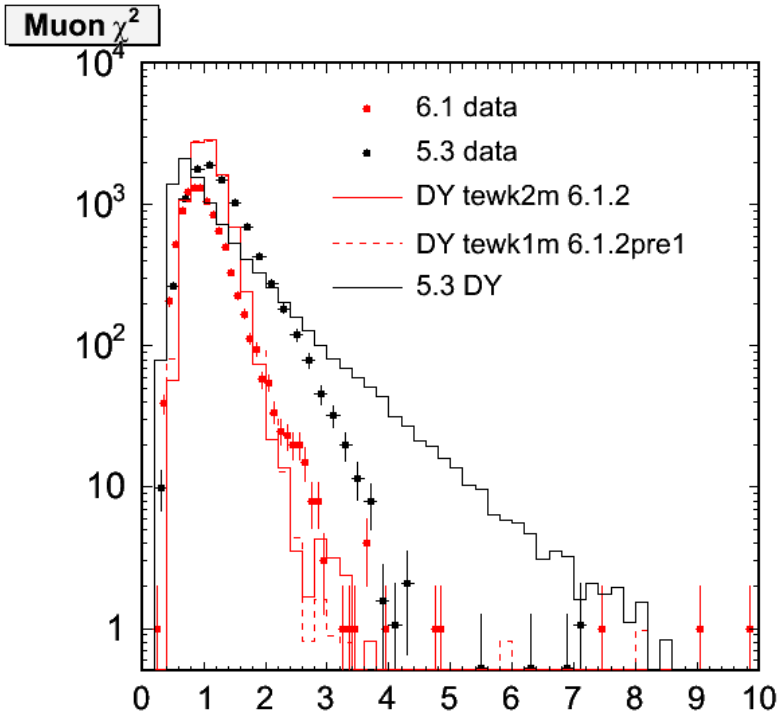
- Good agreement data and MC:
  - is the behavior at low Had energy understood ?

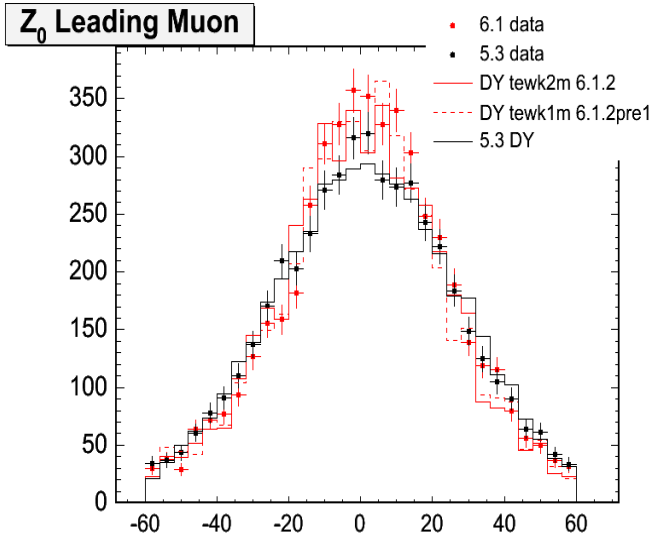


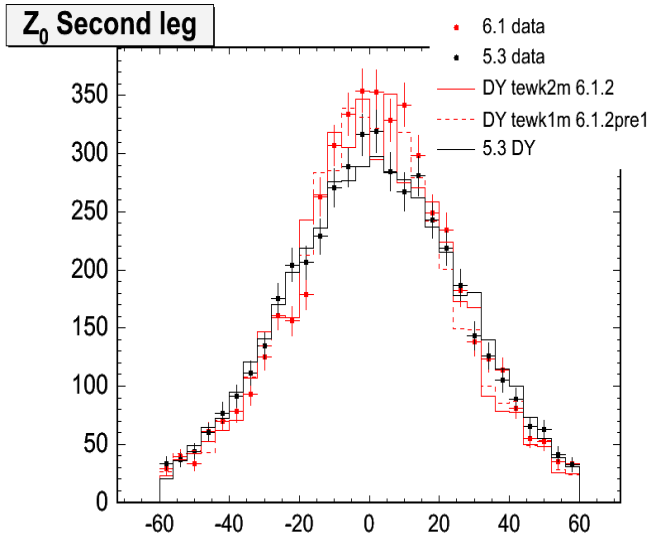


Muon tracking: chi2 and Z0

- Include t0 into the track parameters fit
- New MC reproduces data – chi2 cut can be introduced again at analysis level
  - 6.1: MC slightly higher than in data
  - Different behavior in the tail







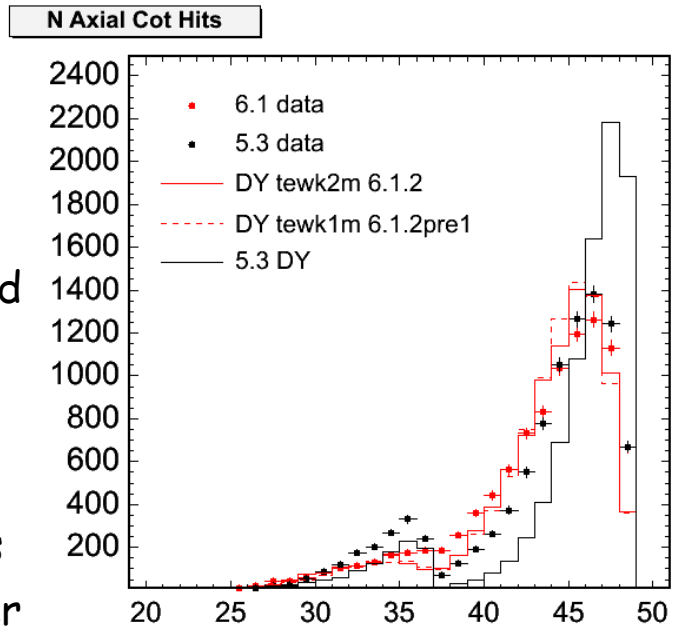
Muon tracking: hits and segments

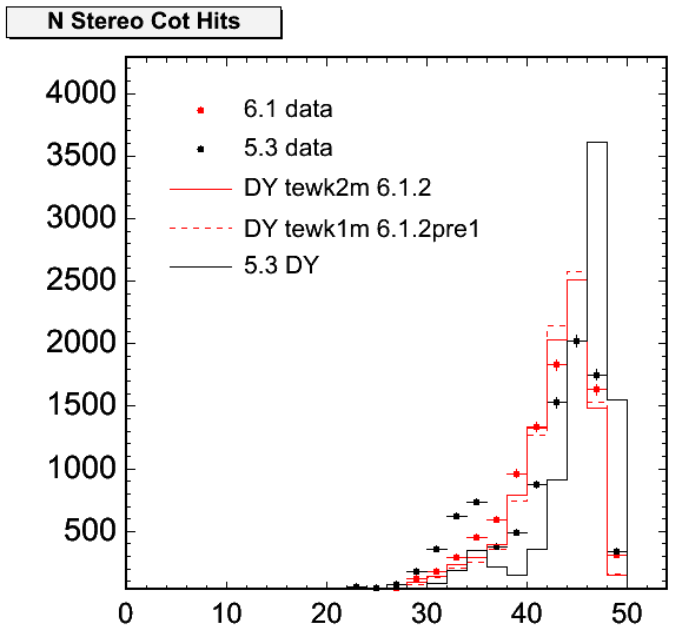
-Search for hits missed in SL

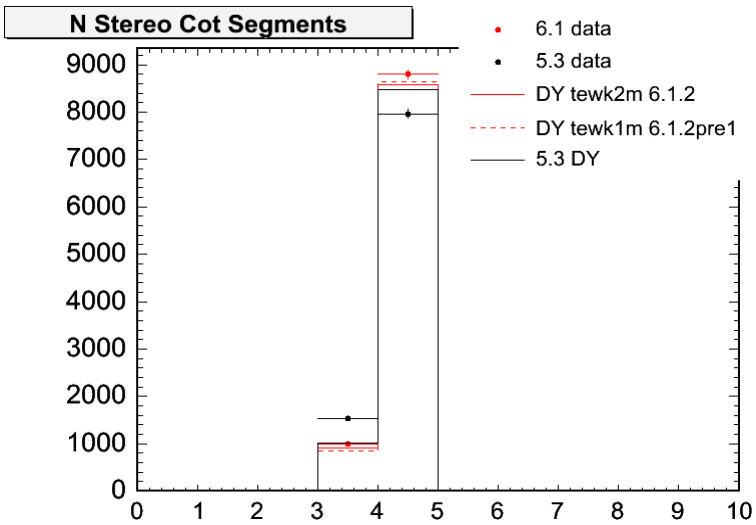
-Refit the tracks

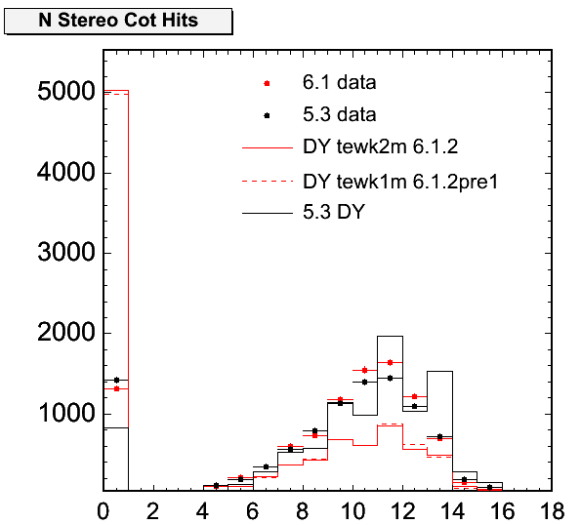
➢Recover lost segments

➢Increases the number of hits/track









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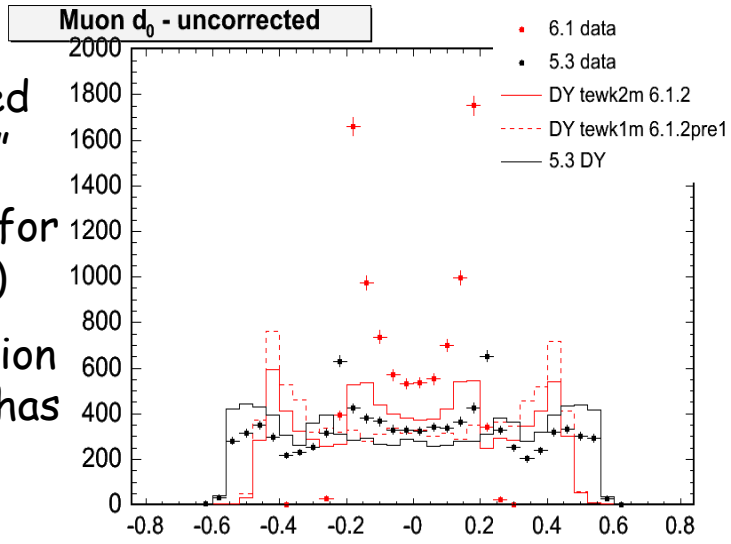
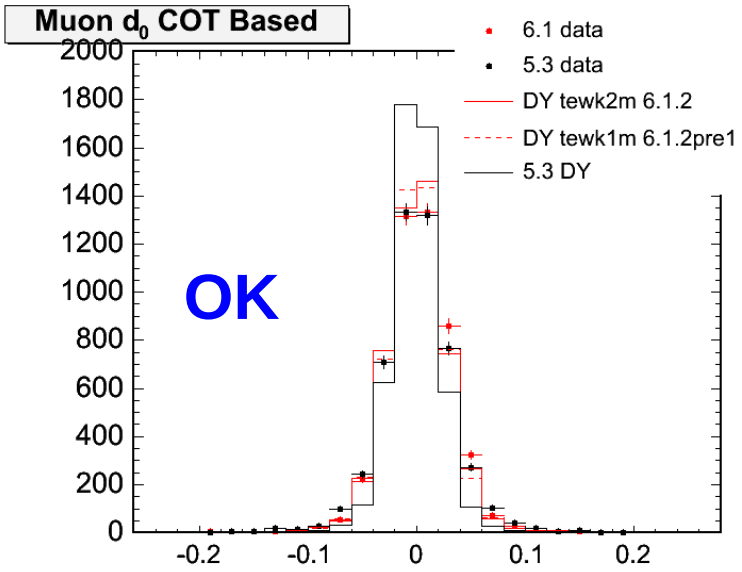
Muon Tracking: d0

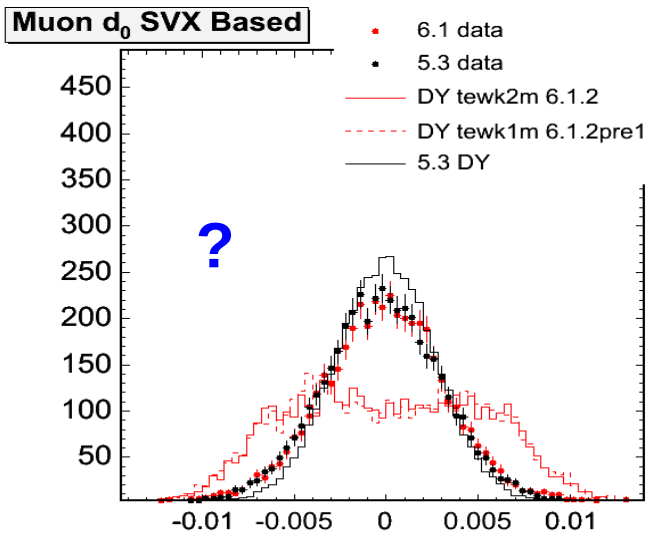
Beam pos retrieved based on "status"

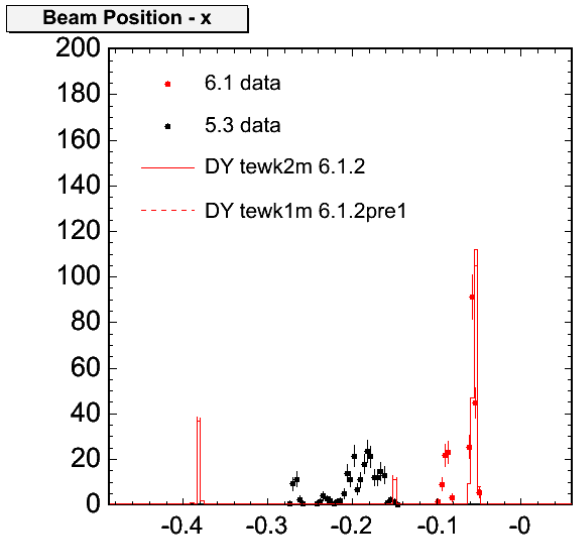
(know database pb for runs with bad Si)

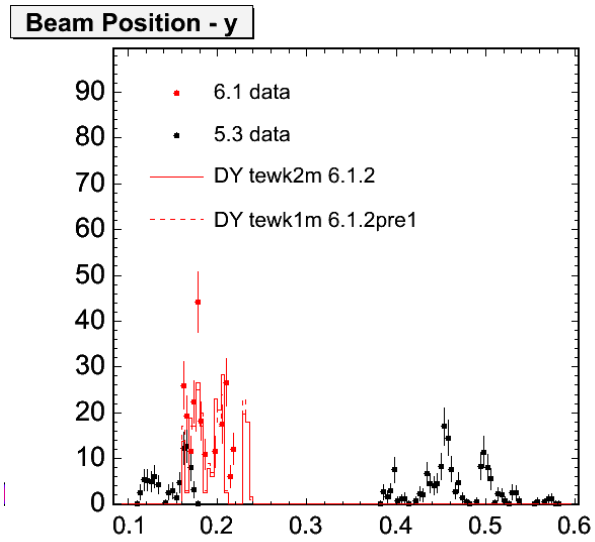
SVX based correction of d0 only if track has Si hits











CMX geometry

Normalize to number of Z events

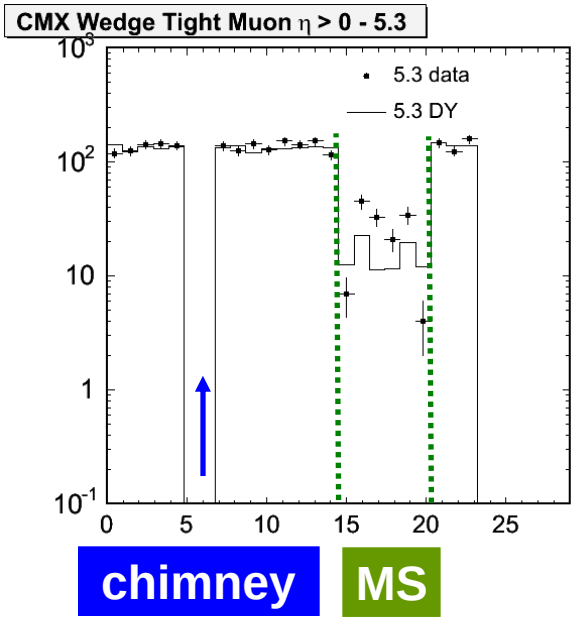
Muon is NOT require to be CMX Fid

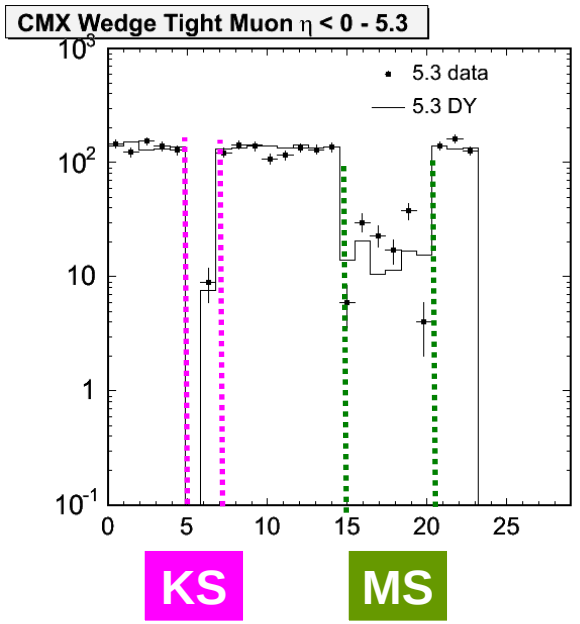
- Accept muons in KS-MS

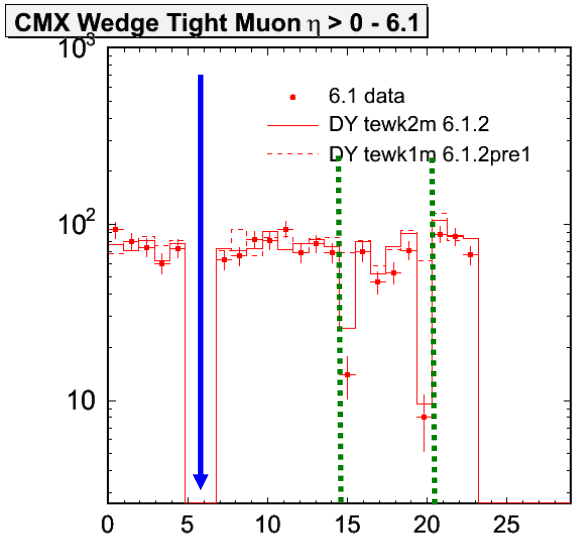
only if pt < 20 GeV

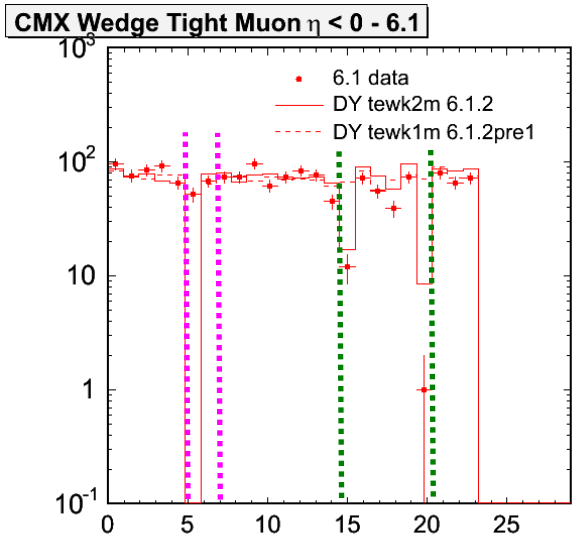
Run Range	CMX Status
rn<150145	CMX unstable
150145 <rn< 190696	Miniskirt and Keystone unstable

Run Range	CMX Status
rn>190697	CMX ok



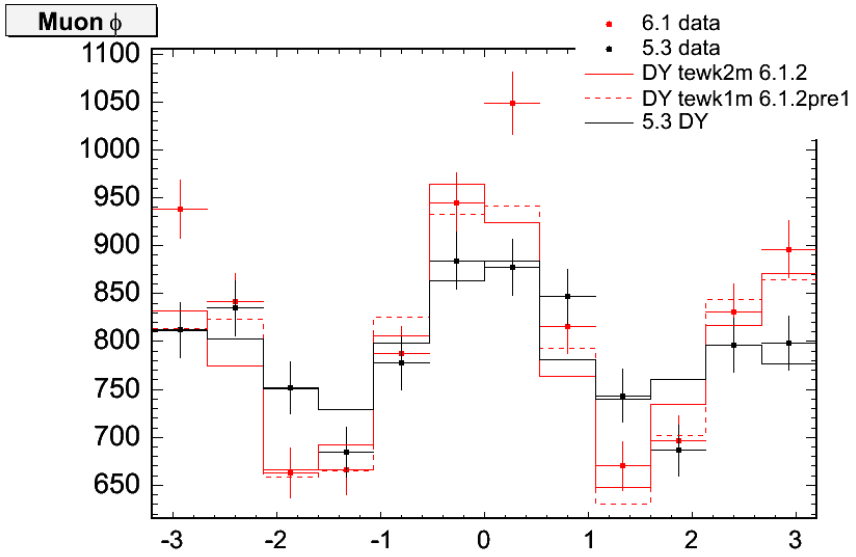


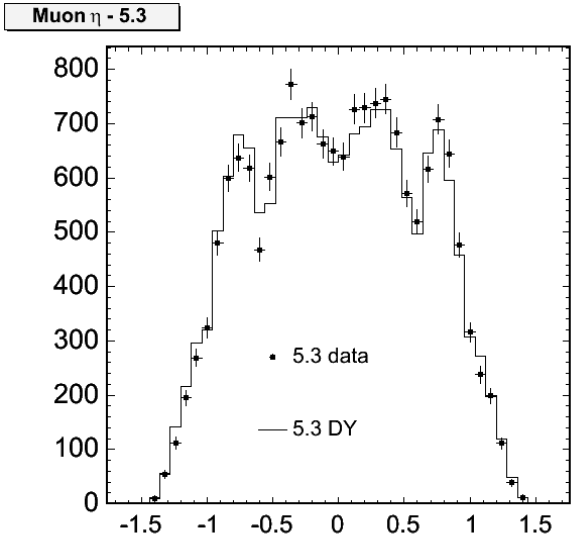


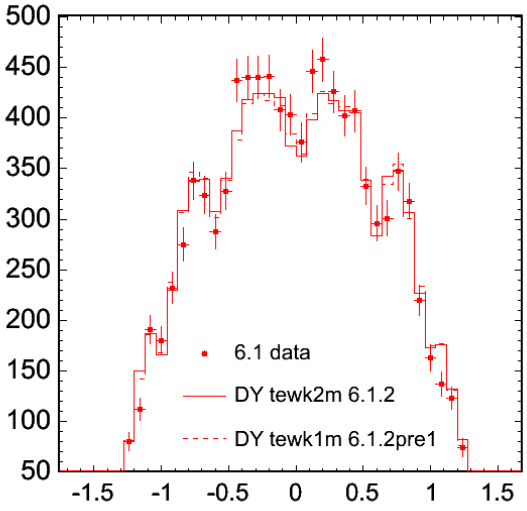


Eta and Phi distribution

Normalize to the number of Z events







Improvement in the CMX region due to implementation of Miniskirt and Keystone

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Summary

Validation of 6.1.2 Drell Yan MC

- Comparison to 6.1.2pre1 DY MC, 5.3 and 6.1 data
- Invariant mass distribution shows RMS larger than 6.1 (5.3) data
- Good agreement in all muons variables, but
  - Problem in d0 distribution (ntuple level or simulation level?)
  - CMX geometry tested

Back up Slides

Muon ID

HIGH pt

CMU and CMP or CMX stub
DX 3,5,6 for CMU, CMP, CMX
Fiducial in CMU and CMP or CMX
BC pt > 20 GeV
Em E <2 HeV
Had E < 8 GeV
COT Ax Segm (5) > 2
COT St Segm (5) > 1
Fractional iso < 0.1
Z0 < 60 cm
D0 < 0.2 or 0.02 is no Si/Si Hits

Low pt [5;20] GeV

Same as for the high pt except:
DX or Chi2 < 9 applied for the muon matching
Had E < 3.5 + pt/8 GeV

CMIO

Same as for the stub muons except:
BC pt > 10 GeV
Stubless
Not Fiducial in CMUP and not Fiducial in CMX
COT Ax Segm (5) > 2
COT St Segm (5) > 2

Validating 6.1

Validating the first 200pb^{-1} of 6.1 data available
run range [190697;203799] from August 2004 to September 2005

- compare 5.3 data to 6.1 data
- compare 6.1 data to 6.1 MC (*on going* – 6.1 ntuplizer issues)

<u>What is different with respect to 5.3 ?</u>

- Compiler switch from KAI to GCC
- Tracking specific improvements
  - Include t0 into the track parameters fit
    - For tracks with Pt>300 MeV
    - Determine t0 per primary vertex
    - Constraint the tracks to the vertex t0
    - Improve chi2/dof, residuals
  - Lost segments recovery
    - Search for hits in missed SLs
    - Refit the tracks one extra time
    - Reduces the fraction of lost segments in the inner superlayers by 90%
    - Makes the tracking efficiency more uniform vs luminosity
    - Increases the number of hits/track
- Avalaibility of CMX keystone and miniskirt

<u>How do gen5 and gen6 data compare ?</u>

- Muons and tracks – see next slides
- Electron
  - CEM E scale lower in 6.1 (0.2 GeV)
  - PES 5/9 ratio peaks at higher values in 6.1
  - CES dx and dz narrower in 6.1
  - Need nvtx correction to the ID
- Jets
  - 1% higher scale in gen6 east plug

CMX geometry

Normalize to the number of

Z events

CMX Muon is NOT require to be CMX Fid

Run Range	CMX Status
rn<150145	CMX unstable
150145 <rn< 190696	Miniskirt and Keystone unstable

Run Range	CMX Status
rn>190697	CMX ok